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(71) Applicant(s)

Graham Taylor
29 Crouch Hill Road, BANBURY,
Oxfordshire, OX16 9RG, United Kingdom

(72) Inventor(s)

Graham Taylor

(74) Agent and/or Address for Service

Michael Stanley & Co
PO Box No. 270, BANBURY, Oxon,
OX15 5YY, United Kingdom

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GB 2326823 A GB 1497973 A
GB 1264969 A WO 1994/016914 A1
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(58) Field of Search

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(54) Abstract Title

Power operated lift reclining chair

(57) The chair includes a back support 24, that remains upright during elevation of the seat 21, pivoted 25 to the seat 21. At the front the seat 21 is pivotally 22 attached to a base 11 and a leg rest 38. The seat 21 is raised from a horizontal position to an inclined position by rotating relative to the base. The chair is raised and reclined by a single linear actuator 35 pivotally connected to the base 11 and lower portion of the back support 33. The chair has pivoting 25 arms 27 that remain horizontal during seat movement and preferably a second linear actuator 39 for the leg rests 38.

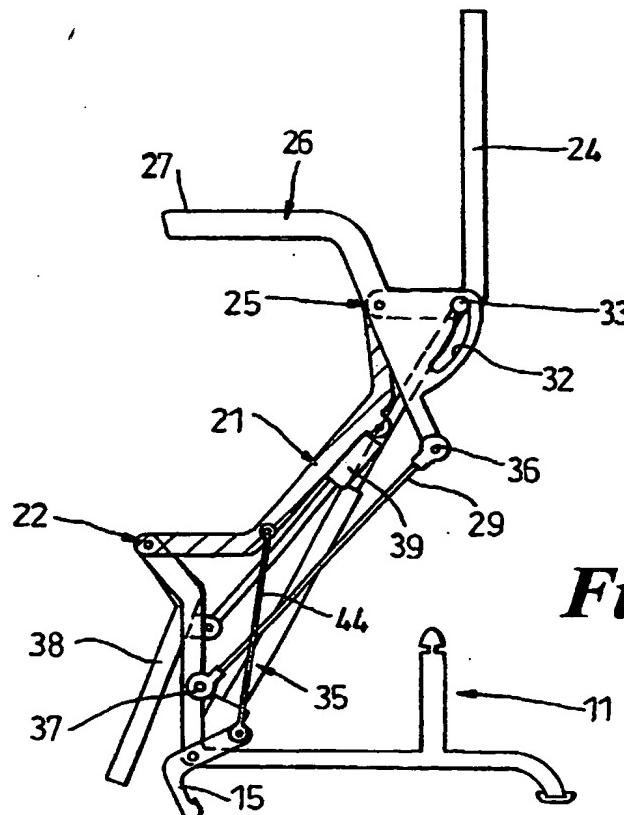


Fig. 4

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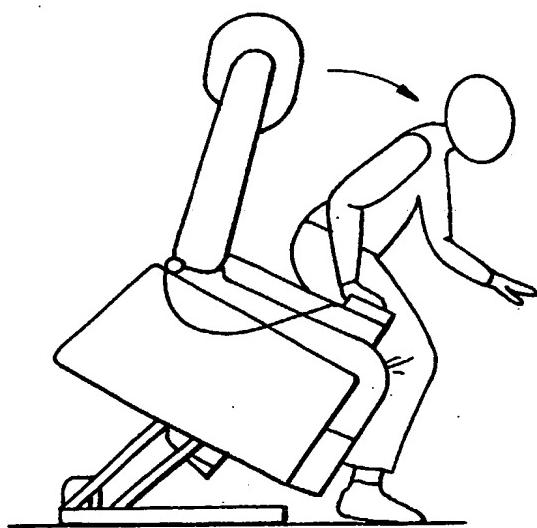


Fig. 1

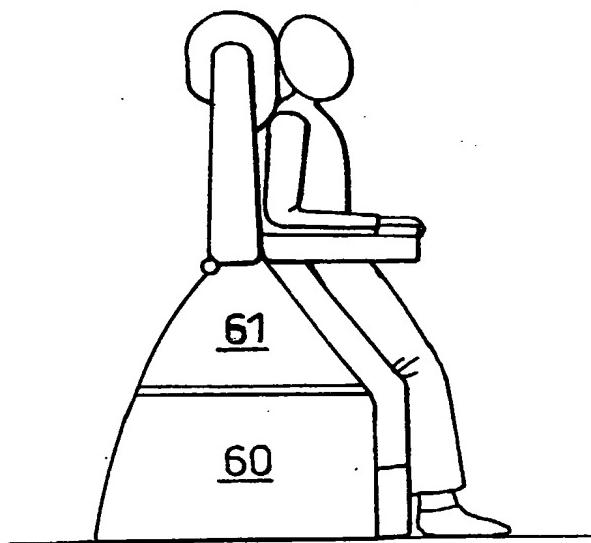


Fig. 5

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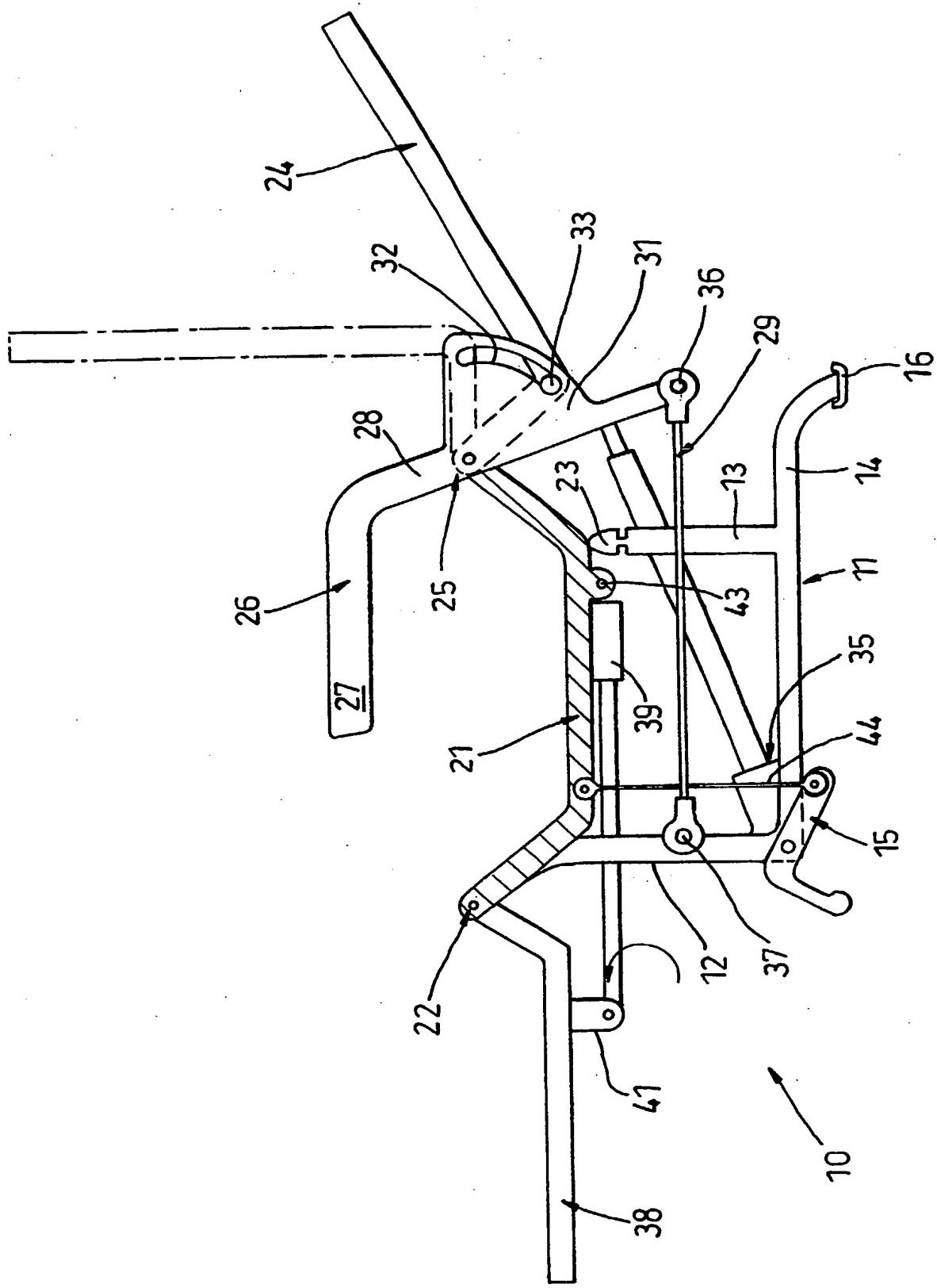


Fig. 2

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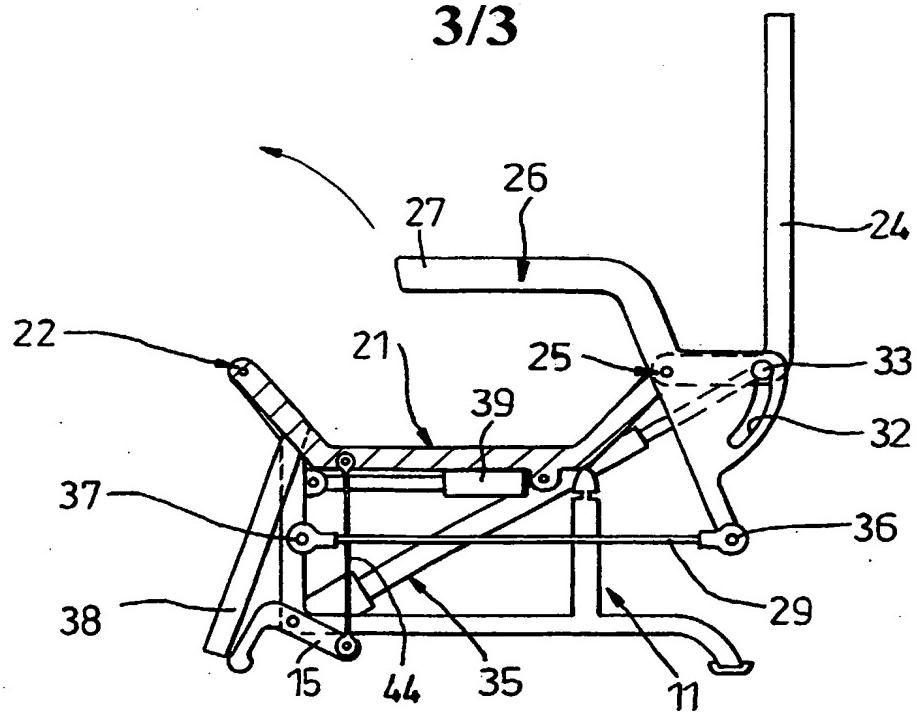


Fig. 3

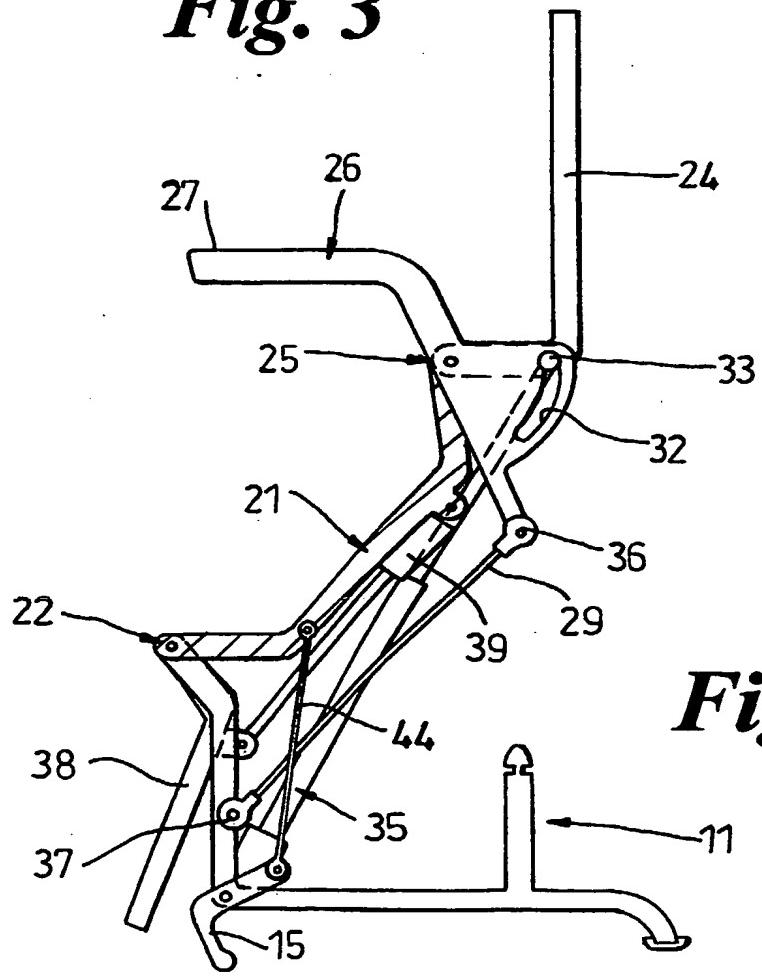


Fig. 4

A Powered Lift Recliner ChairField

5 This invention relates to powered recliner chairs and in particular to powered reclining chairs which also provide lifting assistance to the less-able bodied.

Background of the Invention

10 A typical lift recliner chair is shown in US Patent 5931 532 which shows a recliner chair which comprises a chair which mounted on a frame which is connected to floor mounted lifting mechanism which lifts and tilts the chair to assist a less-abled person to stand. A drawing of this
15 type of lifting action is shown in Fig. 1 of the attached drawings. A disadvantage with this type of chair is that it does not take account of the change in body shape that takes place during standing and the user is almost bodily tipped forward out of the chair. A further disadvantage is
20 that the hinge point for the chair back rest is typically hinged on at the rear of the back and therefore when pivoting down relative to the chair pan tends to pull the shoulders and clothes of a user upwards.

25 A further disadvantage of such chairs is that the lifting mechanism is exposed during the actual lift and since the chairs are powered upwards and downwards accidents can occur if persons or things become trapped in the lift mechanism during both lifting and lowering.

The present invention seeks to more accurately follow the shape of the body when rising from a sitting position to a standing position,

5 Statements of Invention

According to the present invention there is provided a power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base, the seat pan having a back support pivotally connected relative to
10 the back of the seat pan, the seat pan being rotatable on the base to move from a substantially horizontal condition to a raised inclined condition by a powered mechanism, and during said movement the inclination of the seat back to the pan automatically changes so that the seat back remains
15 substantially upright during said movement.

Preferably the chair has arms which remain substantially horizontal throughout said movement. The back support is also pivoted relative to the arms and is capable of limited
20 angular rotation relative to the arms.

The power mechanism includes a linear actuator pivotally connected to both the base and a lower portion of the back support. Preferably the actuator is connected to the back
25 support through a "one way" connection. The "one way" connection may be provided by the actuator having a two piece telescopic actuation rod which can separate on contraction of the actuator if the back support becomes

jammed.

The base is preferably connected to the two chair arms through respective tie rods each of which is pivotally connected at each end to said base and arm, the pivotal connections at each end of the tie rod, between the respective arm and pan, and base and pan forming a collapsible parallelogram linkage with the tie bar maintaining the arms in a horizontal condition.

10

Preferably the chair further including a leg rest pivoted at the front of the pan or body which is operated by a second linear actuator pivotally connected at each end to the rest and pan. The second actuator may be connected to the underside of the pan through a "one way" connection, preferably also a two piece telescopic actuation rod which can separate as previously described.

20 The front of base has feet pivotally attached thereto at the bottom thereof, said feet being linked to the pan so that the rotational upwards movement of the pan relative to the base rotates the feet relative to the base raising the front of the base .

25

Also according to the invention there is provided a power operated lift recliner chair having a chair base including a collapsible frame with a seat pan forming a pivotable

part of the frame, the seat pan being rotatable on the base from a substantially horizontal condition to a raised inclined condition by a powered linear actuator pivotally connected between parts of the frame and operable so that
5 as the actuator extends the seat pan is pushed to a raised condition, and as the actuator contracts the seat pan is not pulled downwards.

Preferably, the actuator includes a telescopic two part
10 actuator rod forming a "one way" connection which permits contraction of the actuator without collapse of the frame if the collapsing or downward movement of the frame is blocked.

15 Another aspect provides a power operated lift recliner chair having a chair base including a collapsible frame with a seat pan being rotatable on the base from a substantially horizontal condition to a raised inclined condition by a powered mechanism during a lifting movement,
20 the chair having arm rests that remain substantially horizontal through out the lifting movement.

A further aspect of the invention provides a power operated lift recliner chair having a chair base including a
25 collapsible frame with a seat pan hinged at the front thereof to a pivot on the base and being rotatable from a substantially horizontal condition to a raised inclined condition by a powered mechanism during a lifting movement,

the pivot on the base being raised during the lifting movement.

Yet another aspect of the invention provides a power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base and which is pivotable relative to the base from a substantially horizontal condition to a raised inclined condition, and a back support being pivotable relative to the pan from an inclined condition relative to the pan to an upright condition relative to the pan, wherein a single linear actuator provides both movement for raising the seat pan relative to the base and for the movement of the seat back relative to the pan.

15

Description of Drawings

The invention will be described by way of example and with reference to the accompanying drawings in which:

- Fig.1 shows the lifting action of a conventional
lift recliner powered chair,
- Fig.2 is a side view of a chair frame of a chair according to the present invention in an "at-rest condition",
- Fig. 3 shows the frame in Fig. 2 in a "sitting condition",
- Fig. 4 shows the frame in Fig. 3 in a "standing position" and
- Fig. 5 shows the lifting action of a chair

according

to the present invention.

Detailed Description of the Invention

With reference to Fig. 2, there is shown the one side of
5 frame 10 of a powered lift recliner chair. The chair
comprises two sides which are mirror images coupled
together by cross members (not shown) and is use will be
upholstered.

10 The frame 10 comprises a rectangular chair base 11 having
front and rear uprights 12 & 13 linked together by a
horizontal base bar 14. The frame 10 has a front foot 15
pivoted to the bottom of the front upright and a fixed rear
foot 16 on a curved down portion of the base bar.

15

A seat pan 21 is hinged to the base 11 at its front end
between the two front uprights 12 by a pivot pins 22. The
rear portion of the pan 21 rests on elastomeric bump stops
23 on the top of the rear uprights 13. A back support 24 is
20 hinged at the back of the seat pan 21 by pivot pins 25. The
back support 24 is "L" shaped in section with the end of
its foot portion pivoted to the seat pan 21 by the pins 25.
A pair of arms 26 are pivoted one on each side of the seat
pan 21 by the same pins 25 at pivot the back support 24 to
25 the back of the seat pan.

The arm 26 are each shaped in the form of a boomerang with
one portion forming horizontal arm rests 27 and the other

portion 28 being inclined downwardly and backwardly with the pins 25 being located in a centre portion of the other portion 28.

The free end portion of other arm portion 28 is pivotally connected via pin 36 to a tie bar 29 whose other end is pivotally connected to the front upright 12 via pin 37 located at about its mid height. Said other arm portion 28 includes a quadrant portion 31 on its upper side which has an arcuate slot 32 formed along its peripheral margin.
10 Headed abutment pins or studs 33 are fixed in each side of the back support 24 at the intersection of its upright and leg portions and locate in the respective slots 32 in the quadrant 31, forming a lost-motion connection between the back support 24 and arm 26.

15

An electrically operated linear actuator 35 is pivotally connected between a cross member on the chair base 11 and the underside of the back support 24 at a point near axes of the pins 33. The actuator 35 is shown in a retracted condition with its body adjacent the cross member and the end of its actuator rod connected to the back support.
20

The hinge points 22, 25, 36, & 37 form a collapsible parallelogram with the seat pan 21, other arm portion 28, 25 tie bar 29 and upright 12 forming a four bar linkage.

A foot or leg rest 38 is hinged to the front of the seat pan 21 by the pins 22. An electrically operated actuator 39

is pivotally connected between hinges 41 on the back of the leg rest and hinges 43 on the underside of the seat pan with the actuator body adjacent the pan 21 and the end of its actuator rod fixed to the underside of the leg rest 38.

5

Each front foot 15 is "L" shaped and is pivoted by one arm to bottom of a respective front upright 12, with the end of the arm being pivotally connected to the side of the seat pan 21 by a link 44.

10

The actuators 35 & 39 are electrically operated linear actuators having reciprocable actuator rods comprising at least two telescopic parts which are in abutment under load conditions but may freely separate.

15

The chair frame 10 is constructed from steel and the leg rest 38, seat pan 21, back support 24 and arms 26 are fabricated from sheet steel. The dished shape of the leg rest, seat pan and back support are filled with upholstery
20 so that the "at-rest" condition shown in Fig. 2 the upholstered upper surfaces of the leg rest and seat pan are substantially level and the upholstered seat surface and the inclined upholstered surface of the back support intersect close to the hinge point 25.

25 The actuator 39 is fully extended and the actuator 35 is fully retracted and the arms 26 are substantially horizontal.

The actuator 39 is operated to contract and the leg rest 38 is allowed to pivot downwards under its own weight through an arc of upto 100 degrees until it is close to the base frame 11. Since the telescopic actuator rod parts can 5 separate on contraction of the actuator no pull load is exerted on the leg rest 38 and the actuator need not be accurately set to abut the frame 11. This also acts as a safety device if the rest 38 jams or something becomes trapped between the rest and frame.

10

The actuator 35 is caused to extend and the back support 24 is pivoted about the pins 25 by upto 70 degrees of arc to a substantially upright position shown in dotted line in Fig 1. This relative rotational movement is facilitated by 15 the lost-motion connection between the arms 26 and back support 24 and is guided by the studs 33 in the arcuate slot 32 and limited by abutment of the studs with the ends of their respective slots.

20 Intermediate positions for the leg rest 38 and back support 24 can be selected to achieve the most comfortable condition for the users.

With the leg rest 38 down and the back support 24 up-right 25 the chair is in a sitting condition as shown in Fig 2.

To achieve the standing condition shown in Fig. 3, the actuator 39 will be fully retracted and the actuator 35 is

extended. The seat pan 21 pivots about the hinge 22 and the actuator 35 acting through the back support 24, studs 33, arm 26 and pivot pins 25 pushes the rear of the seat pan 21 upwards. The actuator 35 becomes fully extended and 5 locks out when the back support 24 is substantially upright that is about 5 degrees from vertical. As the actuator 35 extends the seat pan 21 lifts and tilts forwards around the hinge point 22. The arm rests 27 are held substantially horizontal and the back support 24 at about 5 degrees by 10 the tie bar 29 throughout the whole movement. The four hinge points 22, 25, 36, & 37 maintain a substantially "parallelogram" relationship during this process.

As the seat pan 21 lifts, the link 44 causes the front foot 15 15 to rotate and lift the front of the chair so that the hinge points 22 move vertically upwards to position the hinge points at the approximate knee height of the user. During the movement to the standing position the 20 inclination of the back support to the seat pan changes continuously from being substantially normal thereto to being substantially in line therewith. This shown in Fig. 5 where its can be seen that a user is delivered almost vertically on their feet with the support arms remaining horizontal through out the movement.

25

The movement of chair and the change of orientation of the chair parts more closely matches the actual body movement of a user than conventional powered lift chairs.

During the reverse from standing to sitting, the actuator 35 contracts and the seat pan and back support move downwards under gravity. One part of the two part actuator rod contracts with the actuator and the other part is fixed 5 to the back support 24. If the chair mechanism jams, or something is caught in the mechanism, the actuator can continue to contract without collapsing the chair frame since the telescopic parts of the actuator rod merely move apart. The back support and seat pan are therefore not 10 powered down to the seating position.

The chair frame 11 may be provided with shield parts 60 around the base 11 and telescopic shield parts 61 attached to the seat pan 21 , as is shown in Fig 5 so that the 15 working mechanism of the chair is enclosed.

Claims

1. A power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base,
5 the seat pan having a back support pivotally connected relative to the back of the seat pan, the seat pan being rotatable relative to the base moving from a substantially horizontal condition to a raised inclined condition by a powered mechanism, and during said movement the inclination
10 of the seat back to the pan automatically changes so that the seat back remains substantially upright during said movement.
2. A chair as claimed in Claim 1 wherein the chair has arms
15 which remain substantially horizontal throughout said movement.
3. A chair as claimed in claim 2 wherein the back support is also pivoted relative to the arms and is capable of
20 limited angular rotation relative to the arms.
4. A chair as claimed in Claim 3 wherein each arm has a quadrant portion having an arcuate slot therein and a respective abutment on the support engages in each slot so
25 that support becomes rotationally fast with the arm when the abutments contact the ends of the slots.
5. A chair as claimed in any one of Claims 1 to 4 wherein

the power mechanism includes a linear actuator pivotally connected to both the base and a lower portion of the back support.

5 6. A chair as claimed in Claim 5 wherein the actuator is connected between the base and the back support through a "one way" connection which permits contraction of the actuator without movement of the back support.

10 7. A chair as claimed in Claim 5 and Claim 6 wherein the base is connected to the two chair arms through respective tie rods each of which is pivotally connected at each end to said base and arm , the pivotal connections at each end of the tie rod, between the respective arm and pan, and 15 base and pan forming a collapsible "parallelogram" linkage with the tie bar maintaining the arms is a substantially horizontal condition.

20 8. A chair as claimed in any one of claims 1 to 7 and further including a leg rest pivoted at the front of the pan or body which is operated by a second linear actuator pivotally connected at each end to the rest and pan.

25 9. A chair as claimed in Claim 8 wherein the second actuator is connected to the underside of the pan through a "one way" connection.

10. A chair as claimed in Claim 8 or Claim 9 wherein the foot rest is pivoted at the front of the body on the same

axis as the pan is pivoted to the body.

11. A chair as claimed in any one of Claims 1 to 10 wherein
the front of base has feet pivotally attached thereto at
5 the bottom thereof, said feet being linked to the pan so
that rotational upwards movement of the pan relative to the
base rotates the feet relative to the base raising the
front of the base .
- 10 12. A chair as claimed in Claim 11 when dependant upon
Claims 8 to 10 wherein the footrest is automatically
lowered as the seat pan moves to a raised inclined
position.
- 15 13. A power operated lift recliner chair having a chair
base including a collapsible frame with a seat pan forming
a pivotable part of the frame, the seat pan being rotatable
on the base from a substantially horizontal condition to a
raised inclined condition by a powered linear actuator
20 pivotally connected between parts of the frame and operable
so that as the actuator extends the seat pan is pushed to
a raised condition, and as the actuator contracts the seat
pan falls under gravity and is powered downwards.
- 25 14. A power operated lift recliner chair having a chair
base including a collapsible frame with a seat pan forming
a pivotable part of the frame, the seat pan being rotatable
on the base from a substantially horizontal condition to a

raised inclined condition by a powered mechanism including a linear actuator pivotally connected between parts of the frame, wherein the actuator includes a telescopic two part actuator rod which permits contraction of the actuator 5 without collapse of the frame if the collapsing movement of the frame is blocked.

15. A power operated lift recliner chair having a chair base including a collapsible frame with a seat pan being 10 rotatable relative to the base from a substantially horizontal condition to a raised inclined condition by a powered mechanism during a lifting movement, the chair having arm rests that remain substantially horizontal through out the lifting movement.

15

16. A power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base and which is pivotable relative to the base from a substantially horizontal condition to a raised inclined 20 condition, and a back support being pivotable relative to the pan from an inclined condition relative to the pan to an upright condition relative to the pan, wherein said a single linear actuator which provides both movement for raising the seat pan relative to the base and for the 25 movement of the seat back relative to the pan.

17. A power operated lift recliner chair having a chair

base including a collapsible frame with a seat pan hinged at its front to a pivot on the base and being rotatable from a substantially horizontal condition to

Amendments to the claims have been filed as follows

1. A power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base,
5 the seat pan having a back support pivotally connected relative to the back of the seat pan, the seat pan being rotatable relative to the base moving from a substantially horizontal condition to a raised inclined condition by a powered mechanism, and during said movement the inclination
10 of the seat back to the pan automatically changes so that the seat back remains substantially upright during said movement.
2. A chair as claimed in Claim 1 wherein the chair has arms
15 which remain substantially horizontal throughout said movement.
3. A chair as claimed in claim 2 wherein the back support is also pivoted relative to the arms and is capable of
20 limited angular rotation relative to the arms.
4. A chair as claimed in Claim 3 wherein each arm has a quadrant portion having an arcuate slot therein and a respective abutment on the support engages in each slot so
25 that support becomes rotationally fast with the arm when the abutments contact the ends of the slots.
5. A chair as claimed in any one of Claims 1 to 4 wherein

the power mechanism includes a linear actuator pivotally connected to both the base and a lower portion of the back support.

5. 6. A chair as claimed in Claim 5 wherein the actuator is connected between the base and the back support through a "one way" connection which permits contraction of the actuator without movement of the back support.
10. 7. A chair as claimed in Claim 5 and Claim 6 wherein the base is connected to the two chair arms through respective tie rods each of which is pivotally connected at each end to said base and arm, the pivotal connections at each end of the tie rod, between the respective arm and pan, and 15 base and pan forming a collapsible "parallelogram" linkage with the tie bar maintaining the arms in a substantially horizontal condition.
8. A chair as claimed in any one of claims 1 to 7 and further including a leg rest pivoted at the front of the 20 pan or body which is operated by a second linear actuator pivotally connected at each end to the rest and pan.
9. A chair as claimed in Claim 8 wherein the second actuator is connected to the underside of the pan through 25 a "one way" connection.
10. A chair as claimed in Claim 8 or Claim 9 wherein the foot rest is pivoted at the front of the body on the same

- axis as the pan is pivoted to the body.
11. A chair as claimed in any one of Claims 1 to 10 wherein the front of base has feet pivotally attached thereto at the bottom thereof, said feet being linked to the pan so that rotational upwards movement of the pan relative to the base rotates the feet relative to the base raising the front of the base .
- 10 12. A chair as claimed in Claim 11 when dependant upon Claims 8 to 10 wherein the footrest is automatically lowered as the seat pan moves to a raised inclined position.
- 15 13. A power operated lift recliner chair having a chair base including a collapsible frame with a seat pan forming a pivotable part of the frame, the seat pan being rotatable on the base from a substantially horizontal condition to a raised inclined condition by a powered linear actuator pivotally connected between parts of the frame and operable so that as the actuator extends the seat pan is pushed to a raised condition, and as the actuator contracts the seat pan falls under gravity and is powered downwards.
- 25 14. A power operated lift recliner chair having a chair base including a collapsible frame with a seat pan forming a pivotable part of the frame, the seat pan being rotatable on the base from a substantially horizontal condition to a

raised inclined condition by a powered mechanism including a linear actuator pivotally connected between parts of the frame, wherein the actuator includes a telescopic two part actuator rod which permits contraction of the actuator
5 without collapse of the frame if the collapsing movement of the frame is blocked.

15. A power operated lift recliner chair having a chair base including a collapsible frame with a seat pan being
10 rotatable relative to the base from a substantially horizontal condition to a raised inclined condition by a powered mechanism during a lifting movement, the chair having arm rests that remain substantially horizontal through out the lifting movement.

15

16. A power operated lift recliner chair having a chair base, a seat pan pivoted at its front to the chair base and which is pivotable relative to the base from a substantially horizontal condition to a raised inclined
20 condition, and a back support being pivotable relative to the pan from an inclined condition relative to the pan to an upright condition relative to the pan, wherein said a single linear actuator which provides both movement for raising the seat pan relative to the base and for the
25 movement of the seat back relative to the pan.



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Claims searched: 1-12

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4L LATD, LBHB, LBHE

Int Cl (Ed.7): A61G 5/14; A47C 1/035, 1/032, 1/031

Other: Online: EPODOC; WPI; PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2326823 A (SMITH) see especially figures 3, 4 and 8, end of page 2, start of page 3, and last line of abstract	1
Y	GB 1497973 A (GAFFNEY) see figures	1
Y	GB 1264969 A (HODGE) see figures	1 and 8
X, Y	WO 94/16914 A1 (PERRY) see figures 1-8, page 11 lines 16-23, page 14 line 24 to page 15 line 2, page 15 lines 20-26, page 18 line 23 to page 19 line 22, page 23 lines 16-28 and page 24 line 5 to page 25 line 21	X = 1-3, 5 and 6 Y = 8
X, Y	FR 2490955 A (MONESTIER) see figures and WPI abstract 1982-F1153E	X = 1 Y = 8
X, Y	US 5806920 A (BLOUNT) see figures and column 4 lines 41-67	X = 1 Y = 8
X, Y	US 5219204 A (BATHRICK) see figures	X = 1 Y = 8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.